[0009] There therefore exists a need for a method for automatic reconfiguration of a WDM optical network that performs wavelength selective routing, to permit agile reconfiguration in dynamic response to requests for service.

SUMMARY OF THE INVENTION

[0010] It is therefore an object of the information to provide a method and system for controlling and reconfiguring an agile optical network.

[0011] It is a further object of the invention to provide a method and system for controlling an agile optical network using constraint-based rules that minimizes the computational effort required for computing new routes through the agile network.

[0012] The invention therefore provides a system for adaptively controlling communications channels in a wavelength division multiplexing (WDM) optical network that performs wavelength selective switching. The system comprises a wavelength and route manager (WRM) that determines a communications channel to be set up to satisfy a request for service between two network elements (A and B) using a channel selection algorithm that references at least one rule abstracted from a physical constraint on signal transmission through the optical network to select at least one wavelength for providing the communications channel between A and B. The system also uses a constraint-based route validator for verifying that the at least one wavelength is viable, and means for effecting the setup of the at least one wavelength between A and B to

provide the communications channel if the constraint-based route validation determines that the route is valid.

[0013] The system further comprises a service manager adapted to receive the requests for service, and exchange admission control signaling messages with edge network elements.

[0014] The system also includes a capacity manager adapted to receive a request for connection capacity between specified network elements; determine if there is available capacity to satisfy the request on an existing communications channel between the specified network elements; if there is available capacity on an existing communications channel, allocate the capacity to the service request, and return a message to the service manager identifying the existing communications channel; and if a communications channel with available capacity does not exist, to send a message to the WRM requesting that a channel be set up to satisfy the service request.

[0015] The channel selection algorithm comprises: a route selector adapted to evaluate routes between A and B in accordance with at least one criterion, and to use the evaluation values to select a route; and a wavelength selector adapted to select the at least one wavelength for the communications channel on the selected route.

[0016] The route selector further comprises a route evaluation algorithm adapted to determine a value associated with at least one of a number of optical links in the route; a sum of lengths of the optical links in the route; and, a sum of costs associated with each optical link in the route, for each route evaluated; and to use the

determined value of each route to select a route with a preferred value.

[0017] The wavelength selector is adapted to select the at least one wavelength subject to constraints that include each of the at least one wavelengths is not indicated to be currently used on any section in the route; and if regeneration is required, a regenerator is available to regenerate the at least one wavelength in response to regeneration opportunity information. The wavelength selector is further adapted to access a data store in order to retrieve at least one of wavelength utilization information, and regeneration opportunity information. The wavelength selector is further adapted to obtain a distance traversed between A and B over the selected route, and to compare the distance with a predefined regeneration threshold in order to estimate a number (R) of regenerations required for a channel on the route, R being used to select R available regeneration points on the route. The wavelength selector is also adapted to generate sets of R regeneration points; evaluate the respective sets of R regeneration points in accordance with at least one criteria; and select a set of regeneration points that achieves a highest evaluation among the sets evaluated.

[0018] The constraint-based routing validator receives an identifier of the at least one wavelength selected by the WRM, and is adapted to parse the at least one wavelength into respective sections; obtain parameters of transmission equipment in each of the sections; and determine if signal transmission through the respective sections is viable. The sections are defined by a route selected by the WRM.